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EXAMINER	
WANG, QUAN ZHEN	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/657,742	Applicant(s) COHEN ET AL.	
	Examiner Quan-Zhen Wang	Art Unit 2633	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-34 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-34 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 22 and 25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 22 recites "...one of said dispersive elements for performing said spectral selection". However, there is only one "dispersive element" introduced before.

Claim 25 recites "...at least one of said dispersive elements for performing said spectral selection". However, there is only one "dispersive element" introduced before.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 1-4, and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morozov (U.S. Patent US 6,345,133 B1) in view of Yan et al. (U.S. Patent US 6,560,396 B1).

Regarding claim 1, Morozov teaches a gain equalizer (fig. 1), comprising: an input port (fig. 1, input fiber 110) receiving light comprising at least two wavelength components (fig. 1, λ1-λ5); a first dispersive element (fig. 1, grating 101) receiving the light and spatially dispersing the wavelength components of the light along a dispersion direction (column 4, lines 13-17); a plurality of variable optical attenuating elements (fig. 1, attenuator array 103) disposed generally along the dispersion direction (fig. 1, attenuators 103-1 ... 103-N), such that each of the attenuating elements is traversed by a different wavelength component of the light (fig. 1, λ1-λ5); a second dispersive element (fig. 1, grating 105) receiving light after passage through at least part of at least one of the plurality of variable optical attenuating elements (fig. 1, the light signals output from element 104), and operative to combine the wavelength components of the light into an output beam (fig. 1, light beam coupled into the output fiber 111); and an output port receiving the output beam (fig. 1, output fiber 111). Morozov differs from the claimed invention in that Morozov does not specifically teach that at least one of the variable optical attenuating elements comprises a variable phase changing element operative to change the phase of part of the cross section of light passing through it. However, it is well known in that art that a variable optical attenuating element may comprise a variable phase changing element operative to change the phase of part of the cross section of light passing through it. For example, Yan teaches an apparatus (fig. 3, non-mechanical variable optical attenuator) to vary the optical intensity by varying the phase of part of the cross section of light passing through it (fig. 3, phase shifter 145). Therefore, it would have been obvious for one of ordinary skill in the art at

the time when the invention was made to incorporate a variable optical attenuator comprising a variable phase changing element operative to change the phase of part of the cross section of light passing through it, such as the one taught by Yan, into the system of Morozov in order increase the reliability and life-time of the variable attenuators.

Regarding claim 2, Yan further teaches that the attenuating element is varied such as to vary the level of light traversing the attenuating element (column 4, lines 40-67 and column 5, lines 1-10).

Regarding claim 3, Morozov further teaches that at least one of the input and output ports is an optical fiber (fig. 1, input and output fibers 110 and 111).

Regarding claim 4, it is inherent that the system of Morozov comprising a controller operative to vary the attenuation of at least one of the variable attenuating elements, such that the light passing through the attenuating element has a predefined level.

Regarding claim 11, Yan further teaches that the phase changing element is a liquid crystal element.

Regarding claim 12, Morozov further teaches that at least one of the dispersive elements is a grating.

2. Claims 14-17, 24-26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomlinson et al. (U.S. Patent US 6,678,445 B2) in view of Yan et al. (U.S. Patent US 6,560,396 B1).

Regarding claim 14, Tomlinson teaches a gain equalizer (fig. 1) comprising: a port (fig. 1, In 108) receiving light comprising at least two wavelength components; a dispersive element (fig. 1, grating 100) receiving the light and spatially dispersing the wavelength components of the light along a dispersion direction; a plurality of variable optical attenuating elements (fig. 1, attenuator array 120; column 4, lines 1-4) disposed generally along the dispersion direction, such that each of the attenuating elements is traversed by a different wavelength component of the light (column 3, lines 18-26); and a reflective surface (fig. 1, mirror 140), operative to reflect light after passage through at least part of at least one of the plurality of variable optical attenuating elements back to the dispersive element, so as to combine the wavelength components of the reflected light into an output beam at the port (fig. 1, out 112). Tomlinson differs from the claimed invention in that Tomlinson does not specifically teach that at least one of the variable optical attenuating elements comprises a variable phase changing element operative to change the phase of part of the cross section of light passing through it. However, it is well known in that art that a variable optical attenuating element may comprise a variable phase changing element operative to change the phase of part of the cross section of light passing through it. For example, Yan teaches an apparatus (fig. 3, non-mechanical variable optical attenuator) to vary the optical intensity by varying the phase of part of the cross section of light passing through it (fig. 3, phase shifter 145). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a variable optical attenuator comprising a variable phase changing element operative to change the phase of part of the cross

section of light passing through it, such as the one taught by Yan, in the system of Tomlinson in order increase the reliability and life-time of the variable attenuators.

Regarding claim 15, Yan further teaches that the attenuating elements are varied such as to vary the level of light traversing the attenuating element (column 4, lines 40-67 and column 5, lines 1-10).

Regarding claim 16, Tomlinson further teaches that at least one of the input and output ports is an optical fiber (fig. 1, In 108).

Regarding claim 17, Tomlinson further teaches that the system further comprising a comprising a controller operative to vary the attenuation of at least one of the variable attenuating elements, such that the light passing through the attenuating element has a predefined level (column 3, lines 6-10).

Regarding claim 24, Yan further teaches that the phase changing element is a liquid crystal element.

Regarding claim 25, as it is understood in view of the above 112 problem, Tomlinson further teaches that the dispersive element is a grating.

Regarding claim 26, Tomlinson further teaches the system further comprises comprising a quarter wave plate (fig. 1, quarter wave plate 130) serially with the plurality of attenuating elements, operative to reduce the polarization dependent loss of the gain equalizer.

Regarding claim 28, Tomlinson further teaches that the light received by the port and the output beam are separated by means of a circulator (fig. 1, circulator 150).

3. Claims 5-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morozov (U.S. Patent US 6,345,133 B1) in view of Yan et al. (U.S. Patent US 6,560,396 B1) and further in view of Yao (U.S. Patent US 6,487,336 B1).

Regarding claims 5-6, the modified system of Morozov and Yan differs from the claimed invention in that Morozov and Yan do not specifically teach a spectrally selective detector providing to the controller at least one signal corresponding to the power level of at least one of the wavelength components; and use the at least one signal to adjust the attenuation of at least one of the variable attenuating element. However, it is well known in the art to use a spectrally selective detector in order to provide feedback information to the controller and adjusting the variable attenuating elements according to the feedback information. For example, Yao teaches a spectrally selective detector (fig. 4B, the combination of elements 450, 460, 470, 480) in order to provide feedback information (fig. 4B 482) to the controller (fig. 4B 490), and individually adjust the attenuating elements (column 4, lines 6-22). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a spectrally selective detector, such as the one taught by Yao, into the modified system of Morozov and Yan to provide feedback information to the controller and adjust the attenuating elements in order to provide proper required gain adjustment.

Regarding claim 7, Yao further teaches that the detector is located such that it measures the power level of at least one of the wavelength components in the output beam (fig. 4B).

Regarding claim 8, the modified system of Morozov, Yan, and Yao differs from the claimed invention in that Morozov, Yan, and Yao do not specifically teach that the detector is located such that it measures the power level of at least one of the wavelength components of the light in the input port. It would have been obvious to one having ordinary skill in the art at the time the invention was made to locate the detector such that it measures the power level of at least one of the wavelength components of the light in the input port, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse, 86 USPQ 70.*

Regarding claim 9, Morozov, Yan, and Yao differs from the claimed invention in that Morozov, Yan, and Yao do not specifically teach the dispersive element for the detector array is one of the dispersive elements in the system. However, it is well known in the art that the dispersive elements in the system of Morozov can be used to perform spectral selection for a detector array. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to re-arrange the detector array to use one of the dispersive elements in the modified in order to reduce the number of dispersive elements in the system.

Regarding claim 10, Yao further teaches that at least one signal corresponding to the power level of at least one of the wavelength components is obtained by means of a power splitter located in the path of the wavelength components of the light (fig. 4B).

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morozov (U.S. Patent US 6,345,133 B1) in view of Yan et al. (U.S. Patent US 6,560,396 B1) and further in view of and the Admitted Prior Art (APA) (page 15, paragraph 0034).

Regarding claim 13, the modified system of Morozov and Yan differs from the claimed invention in that Morozov and Yan do not specifically teach a half wave plate serially with the plurality of attenuating elements, operative to reduce the polarization dependent loss of the gain equalizer. However, as it is pointed out by APA, "it is known in the art" to include a half wave plate serially with the plurality of attenuating elements, operative to reduce the polarization dependent loss of the gain equalizer (the instant application, page 15, paragraph 0034). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a half wave plate serially with the plurality of attenuating elements, as it is disclosed by APA, in the modified system of Morozov and Yan, in order to reduce the polarization dependent loss of the gain equalizer.

5. Claims 18-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomlinson et al. (U.S. Patent US 6,678,445 B2) in view of Yan et al. (U.S. Patent US 6,560,396 B1) and further in view of Yao (U.S. Patent US 6,487,336 B1).

Regarding claims 18-19, the modified system of Tomlinson and Yan differs from the claimed invention in that Tomlinson and Yan do not specifically teach a spectrally selective detector providing to the controller at least one signal corresponding to the power level of at least one of the wavelength components; and use the at least one

signal to adjust the attenuation of at least one of the variable attenuating element. However, it is well known in the art to use a spectrally selective detector in order to provide feedback information to the controller and adjusting the variable attenuating elements according to the feedback information. For example, Yao teaches a spectrally selective detector (fig. 4B, the combination of elements 450, 460, 470, 480) in order to provide feedback information (fig. 4B 482) to the controller (fig. 4B 490), and individually adjust the attenuating elements (column 4, lines 6-22). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a spectrally selective detector, such as the one taught by Yao, into the modified system of Tomlinson and Yan to provide feedback information to the controller and adjust the attenuating elements in order to provide proper required gain equalization.

Regarding claim 20, Yao further teaches that the detector is located such that it measures the power level of at least one of the wavelength components in the output beam (fig. 4B).

Regarding claim 21, Yao further teaches that the detector is connected such that it measures the power level of at least one of the wavelength components of the light received at the port.

Regarding claim 22, as it is understood in view of the above 112 problem, Yao further teaches a linear detector array (fig. 4B, detector array 480). The modified system of Tomlinson, Yan, and Yao differs from the claimed invention in that Tomlinson, Yan, and Yao do not specifically teach the same dispersive element is used for

performing the spectral selection. However, it is well known in the art that the dispersive element in the system of Tomlinson can be used to perform spectral selection for a detector array. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to re-arrange the detector array in the modified system of Tomlinson, Yan, and Yao such that the detector array uses the same dispersive element in order to reduce the number of dispersive elements in the system.

Regarding claim 23, Yao further teaches that at least one signal corresponding to the power level of at least one of the wavelength components is obtained by means of a power splitter located in the path of the wavelength components of the light (fig. 4B).

6. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tomlinson et al. (U.S. Patent US 6,678,445 B2) and in view of Yan et al. (U.S. Patent US 6,560,396 B1) and further in view of Zheng (U.S. Patent US 6,185,347 B1).

Regarding claim 27, the modified system of Tomlinson and Yan differs from the claimed invention in that Tomlinson and Yan do not specifically teach that the light received by the port and the output beam are separated by means of a dual fiber collimator. However, it is well known in the art that a dual fiber collimator to separate an input and out put beam. For example, Zheng teaches a dual fiber collimator (fig. 2c) which separates input and output signals. Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a

dual fiber collimator, as it is taught by Zheng, into the system of Tomlinson and Yan in order to separate the input and output signals.

7. Claims 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morozov (U.S. Patent US 6,345,133 B1) in view of Yao (U.S. Patent US 6,487,336 B1) and further in view of Yan et al. (U.S. Patent US 6,560,396 B1).

Regarding claim 29, Morozov discloses a multi-channel optical gain equalizer (fig. 1) comprising: an input fiber (fig. 1, input fiber 110) receiving a multi-wavelength input; a demultiplexer (fig. 1, grating 101) fed by the input fiber, having a plurality of output wavelength channels (fig. 1, $\lambda 1$-$\lambda 5$); an output fiber outputting a multi-wavelength output (fig. 1, output fiber 111); a multiplexer (fig. 1, grating 105) feeding the output fiber, having a plurality of input wavelength channels; a plurality of variable optical attenuating elements (fig. 1, attenuator array 103), individual ones of the attenuating elements being generally disposed between individual output channels of the demultiplexer and individual input channels of the multiplexer (fig. 1, attenuator array 103). Morozov differs from the claimed invention in that Morozov does not specifically teach at least one signal detector detecting the power in at least one of the input wavelength channels of the multiplexer, and operative to adjust the attenuation of the attenuating element associated with the at least one input wavelength channel, according to the power of the signal detected. However, it is well known in the art to use a spectrally selective detector in order to provide feedback information to the controller and adjusting the variable attenuating elements according to the feedback

information. For example, Yao teaches a spectrally selective detector (fig. 4B, the combination of elements 450, 460, 470, 480) in order to provide feedback information (fig. 4B 482) to the controller (fig. 4B 490), and individually adjust the attenuating elements (column 4, lines 6-22). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a spectrally selective detector, such as the one taught by Yao, into the system of Morozov to provide feedback information to the controller and adjust the attenuating elements in order to provide proper required gain equalization. The modified system of Morozov and Yao further differs from the claimed invention in that Morozov and Yao do not specifically teach that at least one of the variable optical attenuating elements comprises a variable phase changing element operative to change the phase of part of the cross section of light passing through it. However, it is well known in that art that a variable optical attenuating element may comprise a variable phase changing element operative to change the phase of part of the cross section of light passing through it. For example, Yan teaches an apparatus (fig. 3, non-mechanical variable optical attenuator) to vary the optical intensity by varying the phase of part of the cross section of light passing through it (fig. 3, phase shifter 145). Therefore, it would have been obvious for one of ordinary skill in the art at the time when the invention was made to incorporate a variable optical attenuator comprising a variable phase changing element operative to change the phase of part of the cross section of light passing through it, such as the one taught by Yan, in the system of Morozov and Yao in order increase the reliability and life-time of the variable attenuators.

Regarding claim 30, Yao teaches that at least one signal detector detecting the power in at least one of the input wavelength channels of the multiplexer is a spectrally selective detector in series with the output fiber (column 4, lines 6-22).

Regarding claim 31, the modified system of Morozov, Yao and Yan differs from the claimed invention in that Morozov, Yao and Yan do not teach that the detector is located remotely from the gain equalizer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to remotely locate the detectors, such as at the receiver end of the signals, since it has been held that rearranging parts of an-invention involves only routine skill in the art. *In re Japikse, 86 USPQ 70.*

Regarding claims 32-33, Morozov further teaches that the demultiplexer comprises a dispersive grating, such that the plurality of output wavelength channels are spatially dispersed; and the multiplexer comprises a dispersive grating, such that the spatially dispersed plurality of wavelength channels are combined into one channel (fig. 1, gratings 101 and 105).

Regarding claim 34, Yan further teaches that the phase changing element is a liquid crystal element.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Koteles et al. (U.S. Patent Application Publication US 2002/0109908 A1) disclose an optical dynamic gain equalizer using both attenuator and

amplification. Brophy et al. (U.S. Patent US 6,275,623 B1) teach a dynamically configurable spectral filter which can be used as a dynamic gain equalizer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quan-Zhen Wang whose telephone number is (571) 272-3114. The examiner can normally be reached on 9:00 AM - 5:00 PM, Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. R. Sedighian
M. R. SEDIGHIAN
PRIMARY EXAMINER

qzw
04/15/05